Bacterial requirements

Water: Used to dissolve materials to be transported across the cytoplasmic membrane

Carbon: required for the construction of all organic molecules

- Autotrophs use inorganic carbon (CO_2) as their carbon source
- Heterotrophs: use organic carbon

Nitrogen: Obtained from:

- Inorganic source: e.g. Nitrogen gas (N_2), Nitrate (NO_3), Nitrite(NO_2), and Ammonia (NH_3)
- Organic source: e.g. Proteins, broken down to amino acids
- Many organisms use nitrogen gas by nitrogen fixation to produce ammonia

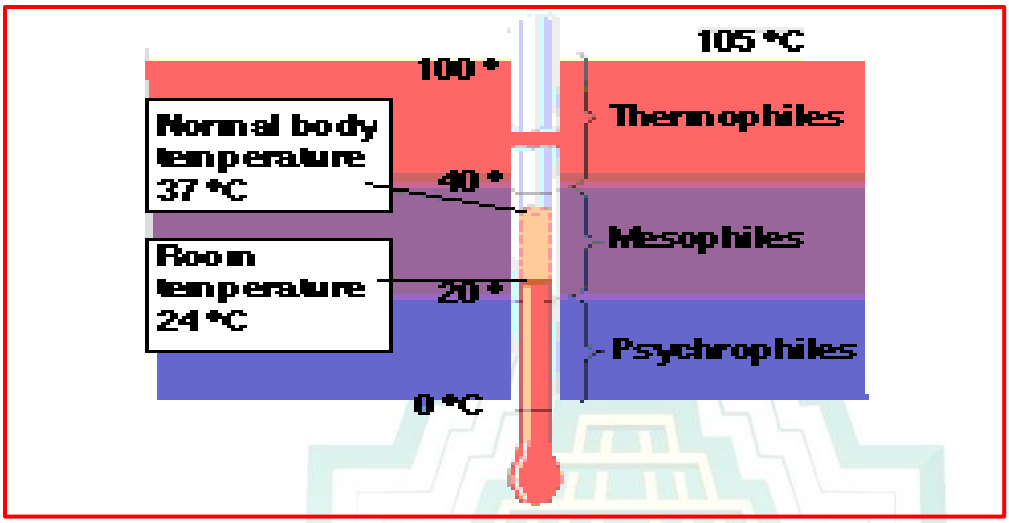
Other nutrients: Required in small amounts such as Iron, Sulfur, and Phosphorus

Temperature Requirements

Psychrophiles: Are defined as cold-loving bacteria. Specifically, their cardinal temperatures are 20 °C for maximal growth, 15 °C or lower for optimal growth, and 0 °C or lower for minimum growth

Mesophiles: Are microorganisms which grow at moderate temperatures between 20 °C and 45 °C and with an optimum growth temperature in the range of 30–39 °C

Thermophiles: Thermophiles are micro-organisms that grow optimally at between 55 and 65 °C but can grow between 40 and 90 °C. Thermophilic bacteria are spore formers.



Oxygen Requirements

• Required for aerobic respiration and energy production

• Organisms are classified according to their gaseous requirements

1. Obligate aerobes : is an organism that requires oxygen to grow. ex. *Pseudomonas.*

2. Facultative anaerobes: any organism that is able to grow either with or without free oxygen. Ex. *Escherichia coli*

3. Obligate anaerobes: Are microorganisms that can only survive in oxygen-free environments as free oxygen molecules are toxic to them. ex. *Clostridium*

Salinity Requirements

Halophiles: are the class of microorganisms that grow optimally at high NaCl concentrations

Moderates Halophiles: grows at salt concentration of 3-15% (w/v) and can tolerate 0-25% (w/v)

Extreme Halophiles: Grow well at NaCl concentrations of greater than 15% .

Bacterial pH Requirements

Microbes have different optimum pH requirements:

Acidophiles: are organisms that grow at an optimum pH below 3–4.

Neutrophiles: They grow optimally at a pH within one or two pH units of the neutral pH of 7, between 5 and 8

Alkalinophiles: are a class of extremophilic microbes capable of survival in alkaline (pH roughly 8.5–11) environments, growing optimally around a pH of 10